

1st. An air-warming chamber. 2nd. Minutely divided emitted currents from it into the building; and, 3rd. A controlled external discharge for the vitiated air, ready, and capable of being made sufficiently active at all seasons. The practicable method of carrying out this combined operation is beyond consideration for ordinary dwellings, excepting in cases where they might be constructed as a block of building for a number of families, as has been frequently proposed."

The ventilation for common dwelling-houses can be carried no further, and need not be, in my opinion, than by admitting a regulated quantity of air by the upper sash, or by applying in one of the upper panes some of the various guards to shield such apertures, as Faira's Movable Glass Louvres, Dr. Guy's Perforated Guarded Plates, or Bailey's Fixed Louvre, with a covering slide. Either of these will fulfil the purpose for the admission of air, and for the withdrawal of the same we have no means at hand so simple, so ready, and so costless as our usual chimney draught. Presuming the fire at the lower level to be capable of performing its part, viz. that of changing the lower stratum of air, there remains only to insert an outlet valve in the upper part of the chimney-breast communicating with the same chimney, to effect a ready and constant renewal of the higher level of air sufficient to meet the wishes of the most particular upon this point.

Again, reverting to outward applications only, there is the following condition, to which our common dwellings are constantly exposed, which would totally defeat such ventilation. One part of a building, or one room is of greater altitude than another, and from the presence of an excess of heat in that portion over the other, or from its altitude, or from other causes productive of a like result, the current is from the lower or less rarefied portion to the higher or more rarefied; here, notwithstanding the outlets from each were furnished with similar perfect forms, yet it would be seen the ventilation would proceed from one of the two in the right direction upward, while the other would be the inlet for a reverse current, only excepting such times as when the power of the wind would be in excess over the rarefying power within the building. The one outlet fulfilling its intent independent of the original proposed outward form, but assisted by it in such times as supposed, and the other, although similar in every way outwardly, yet for any effect by it not only powerless but the actual passage of a reverse action.

I think this will suffice to exemplify the uselessness of depending for ventilation wholly upon any outward formation, as alike contrary to experience and entirely opposed to the usual conditions in which every occupied building exists. I have only one remark to make upon this point, viz. that whatever form may be applied at the external discharge of ventilators to keep out the rain, or guide the discharged current (for this is their legitimate use) in the direction of the prevailing wind, the plan of that form should be the circle, as being the only one equi-distant from the centre affording equal action in all winds.

Drury-lane.

G. B. COOPER.

EXHIBITION OF ARCHITECTURAL DRAWINGS.—The Association of Architectural Draughtsmen exhibited during the past week, at their rooms in Southampton-street, Strand, an interesting collection of their drawings, shewing that they have amongst them some very able men. We have not space to particularize, but we will mention with commendation the works of Mr. L. W. Cullman (whose designs for decorations have been honourably mentioned on several public occasions), Mr. Pritchard, Mr. J. R. Colling, Mr. J. D. Wyatt, Mr. W. B. Colling, Mr. Rodriguez, Mr. E. C. Sayer, the hon. secretary, &c. Architects requiring assistance will do well to apply to the association.

THE EMPEROR OF RUSSIA AND MR. SNOW HARRIS.—Through the medium of the Russian Ambassador, Baron Brunow, his imperial majesty has recently sent to Mr. W. Snow Harris, of Plymouth, a handsome porcelain vase, in token of the great estimation his majesty entertains of Mr. Harris's ability as displayed in his mode of constructing lighting conductors for shipping.

MR. GRAINGER ON FORM OF SEWERS, DRAINS, AND SUPPLY OF WATER.

THE Health of Towns' Association have published a lecture delivered by Mr. R. D. Grainger, of St. Thomas's Hospital, containing a general exposure of the causes of the unhealthiness of towns and its remedies. Foremost amongst the sources of disease in towns is defective drainage and sewerage. "It is impossible to exaggerate," says our author, "the defective state of the drainage generally found in towns: large districts, and those the most densely populated, entirely unprovided with these necessary outlets; sewers and drains placed on the surface, and constantly emitting pestilential exhalations; sewers, even in many of the principal districts in towns, so shallow as to be merely adapted to surface drainage, leaving the basement stories of houses and cellars where these are used for habitations, as in Liverpool and Manchester, altogether undrained, though in a special degree requiring it; sewers and drains constructed upon wrong principles as to form, dimensions, and materials; a want of proper traps to prevent the escape of noisome stenches and effluvia; and, more than all these defects put together, a totally insufficient supply of water, without which, as Dr. Southwood Smith justly observes, 'not only is no good done by a drain, but the very evil intended to be avoided is positively increased and extended.' The necessity of an ample supply of water, which ought to be as freely given as the air we breathe, meets the inquirer in every branch of the question; it matters not what you speak of—of house drains, court drains, street sewerage—of water-closets, privies—of wash-houses, baths, and personal cleanliness—or of decent habits and the comforts of home—to say nothing of the question of whole ranges of warehouses and the revenue of a principality annually destroyed by fire in some of our great cities; in all directions and upon all questions you are met with the want of water. As a complete and effective system of drainage, like so many other sanitary improvements, demands an ample supply of water, the two subjects may be advantageously considered in connection.

The existing system would appear to indicate an expectation that the sewers and drains are to effect many things which it is quite certain they never have and never can accomplish; and, amongst the rest, that by impressing a kind of volition upon the more solid parts of their contents, these latter should obligingly carry themselves off, and in the case of Liverpool, for example, walk into the Mersey, or in that of Manchester, into the Irwell. But this is a kind of feat which matter, with its accustomed stubbornness, will not perform, however much desired. On the contrary, all liquids holding solids in solution or mechanical suspension, are so desirous of getting rid of their burden, that they deposit it whenever and wherever they can.

Wherever there is any delay in the course of the filthy water of towns, there a deposit of offensive and poisonous mud takes place; in every angle and turn—on any the least inequality of surface, an accumulation of solid matter does and must be formed; and as much of this matter is in a state of minute division and moisture, and all of it, periodically, on the falling of rain, it presents precisely those physical conditions which facilitate its escape into the air in the form of a poisonous vapour.

The great law, then, which regulates deposits of matter held in solution, is, that whenever the current is retarded, the solid particles have an increased tendency to subside; or, to speak more exactly, the ordinary law of gravitation operates under more favourable circumstances. It becomes a point of consequence to know, whether there exist in our public and private drains and sewers, and in the surface of streets, courts, and alleys, any causes which will promote deposits according to the above principle. The answer has already been given in the invaluable reports and evidence of the Health of Towns' Commission. By their unnecessary size and defective form, most of the older sewers being flat at the bottom, they cause a retardation in the flow of their muddy contents, and thus, of necessity, produce a lodgment of putrefying animal and vegetable matter. Another source of deposit is the improper direction of these conduits, the

sharp angles and curves of which, especially where the smaller sewers enter the main trunks, lead to obstruction, and to these must be added the various irregularities of surface connected with all masonry, especially when it is originally bad or gets out of order. The construction of house drains is liable to the same remarks, all of them being built of porous materials, much too large for their contents, and ordinarily square, the worst of all forms for such a purpose.

The best form of sewers and drains is a question of much moment. "If they are constructed with a flat bottom, an accumulation of animal and vegetable matter must take place; for in this form of drain the force of the water is weakest precisely where it ought to be the strongest, namely, at the bottom; and in addition to this, the upright side-walls are liable to be forced in and destroyed. The best form of a common sewer is the egg-shape, which conduces to hydraulic pressure, and with this form and a plentiful supply of water, deposits would, to a great extent, be prevented, and whenever these did occur, by increasing the pressure of the water, which can readily be effected, they would be removed and the sewer scoured out. The egg-shaped sewer not only possesses the advantage of superior efficiency, but is likewise much more economical. It has been calculated by Butler Williams, Esq., one of the professors at the college for Civil Engineers, that by substituting this form for the sewer with upright sides and flat at the bottom, there would be a saving in the construction alone of 1,600% per mile.

There is, however, a mode of drainage which to me seems infinitely preferable to any other—I mean the improved *drain tubes* recommended by Mr. Dyce Guthrie. They are circular in form, and are made either of terra-cotta or of common brick clay; and as it is most desirable that all drains should be impermeable, to prevent their poisonous air escaping, Mr. Guthrie proposes that the drain-tubes should be glazed on the inside. "What!" some persons will exclaim, "would you glaze the inside of a drain as you would the inside of a basin to hold food?" Exactly so; and in the end this tubular system of sewerage would be cheaper, for it is not only much less expensive as to material, but in construction and subsequent maintenance. The form being circular, combines these advantages: the drain is strong, and it would thus be enabled to resist the superincumbent pressure; it could be made of much smaller size than the ordinary drain; and it could be readily washed out by a flush of water; indeed, it is probable that the sewer would be kept cleansed by its own action. For house drains and smaller sewers, tubes of from four to six inches in diameter would be sufficient, whilst for larger sewers the size should be from twelve to eighteen inches or more. If this tubular system of impermeable drains could be introduced, with a sufficient supply of water for washing them out, so as to guard against accumulations, the sanitary condition of a town would be immensely improved."

A copious supply of water is important in another respect. "By an improved supply of water in the city of New York, and a high pressure always being kept up in the mains, so that the hose can be directly supplied from them, the cost of insurance against fires has been reduced 25 per cent. Many who are present can form some estimate of the vast sum which such an improvement would effect in Liverpool, not only by a reduction of the yearly premium upon insurance, which, from the losses by fire, has been raised from 8s. to 35s. per cent.—the rate in London, for the same risks, varying from 2s. 6d. to 5s.,—but in the enormous amount of valuable property, which would thus be rescued from destruction. In Philadelphia, and in this country, in Nottingham and other places, corresponding benefits have resulted from similar improvements."

Economy would not only be consulted in this particular, by an ample supply of water, but in every other where it is concerned. It is found in the Holborn and Finsbury district, that by far the cheapest mode of cleansing the sewers is by washing them out, or flushing them, as it is called; in fact, the cost is about one-third of what it used to be: in one cleansing alone there was a saving of expense to the commission of 1,293%. Again, the ordinary expense